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**DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT**

**24 CFR Part 3280**

**[Docket No. FR-5222-F-02]**  
**RIN 2502-A172**

**Manufactured Home Construction and Safety Standards,  
Test Procedures for Roof Trusses**

**AGENCY:** Office of the Assistant Secretary for Housing—Federal Housing Commissioner, HUD.

**ACTION:** Final Rule.

**SUMMARY:** This final rule amends the roof truss testing procedures in the Federal Manufactured Home Construction and Safety Standards by adopting certain recommendations made by the Manufactured Home Consensus Committee (MHCC), as modified by HUD. Pursuant to the National Manufactured Housing Construction and Safety Standards Act of 1974, HUD published a recommendation submitted by MHCC to revise the existing roof truss testing procedures in 2003. In response to public comments, HUD returned the proposal to MHCC for further evaluation. After further consideration, MHCC submitted to HUD an amended version of its original proposal on roof truss testing. HUD was in agreement with the majority of MHCC's revised recommendations on roof truss testing which were published as a proposed rule on June 16, 2010. Many of MHCC's recommendations are included in this final rule. HUD identifies MHCC's proposals that were not accepted, or that were modified in light of public comments received or upon further evaluation, and provides its reasons for not accepting or for modifying these proposed revisions.

**DATES:** Effective Date: January 13, 2014.

**FOR FURTHER INFORMATION CONTACT:** Henry S. Czauski, Acting Deputy

Administrator, Office of Manufactured Housing Programs, Office of Housing, Department of Housing and Urban Development, 451 7th Street, SW, Room 9164, Washington, DC 20410-8000; telephone number 202-708-6409 (this is not a toll-free telephone number). Persons with hearing or speech impairments may access this number through TTY by calling the toll-free Federal Relay Service at 1-800-877-8339.

**SUPPLEMENTARY INFORMATION****I. Background**

The National Manufactured Housing Construction and Safety Standards Act of 1974 (42 U.S.C. 5401-5426) (the Act) authorizes HUD to establish the Federal Manufactured Home Construction and Safety Standards (Construction and Safety Standards), codified in 24 CFR part 3280. The Act was amended by the Manufactured Housing Improvement Act of 2000 (Pub. L. 106-569), which expanded the Act's purposes and created MHCC. Congress established MHCC to provide periodic recommendations to the Secretary to adopt or revise provisions of the Construction and Safety Standards.

In 2002, MHCC began considering revisions to the Construction and Safety Standards and, in 2003, recommended revisions to the current requirements for roof truss testing.<sup>1</sup> Those recommendations were included in HUD's proposed rule to amend the Construction and Safety Standards, published in the Federal Register on December 1, 2004 (69 FR 70016). After considering public comment received on the proposed rule, HUD returned the proposal on truss testing procedures to MHCC. As indicated in the preamble of HUD's final rule published in the Federal Register on November 30, 2005 (70 FR 72024), which followed the December 1, 2004,

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<sup>1</sup> A truss is a triangular structure used to support a roof. Multiple trusses are used to assemble the framework for a roof.

proposed rule, HUD stated that truss testing procedures are too important a safety consideration to leave unaddressed. In returning the rule, HUD also stated that the standards had not been modified in a number of years and needed to be examined to determine whether they were adequate to protect homeowners in all geographic areas of the country. HUD's review of damage assessments following Hurricane Charley reinforced its conclusion regarding the need for the MHCC to ensure that truss testing procedures were updated and adequate to protect homeowners from roof and structural damage accompanying high wind events.

HUD requested MHCC to work expeditiously to reevaluate and resubmit new proposals for truss testing procedures. As a result, the Truss Test Task Force of MHCC's Standards Subcommittee was established. Five teleconferences of this task force were held, and the full MHCC held two teleconferences to review and vote on new truss testing procedures. HUD worked closely with MHCC throughout the review and reevaluation process, and agreed with the majority of the proposals to strengthen the truss testing procedures made by MHCC, but made editorial revisions and modified the MHCC's proposal on uplift testing. Those recommendations and modifications were included in a proposed rule published in the Federal Register on June 16, 2010 (75 FR 34064). After careful review of the public comments received in response to the proposed rule, HUD made additional editorial and other revisions and further modified the MHCC's proposal regarding uplift testing. HUD's additional revisions in response to public comment are reflected in this final rule.

As a result of this final rule, the required truss testing procedures reflect the current industry standards and methods by which trusses are tested by truss fabricators. These procedures also provide flexibility in testing by reducing the amount of time required for the proof load test. Most importantly, they improve the performance and safety of trusses in high wind areas and high snow load areas, and ultimately reduce property damage and prevent injury

and loss of life resulting from high wind events such as hurricanes and tropical storms, as well as injuries and deaths that occur from collapsed roofs under heavy loads. Table A identifies the changes made to the truss testing standards as a result of this final rule.

Table A  
Comparison of Roof Truss Testing Procedures

<b>Previous Testing Requirements</b>	<b>Revised Testing Requirements</b>
<b>Snow Loads/Vertical Loads</b>	<b>Snow Loads/Vertical Loads</b>
Proof Load: 1.75/12 hours or Ultimate Load: 2.5/5minutes	Proof Load: 1.75/12 hours or 2.0/6 hours or Ultimate Load: 2.5/5minutes
<b>Wind Uplift Loads</b>	<b>Wind Uplift Loads</b>
*Wind Zone I: 1.75/3 hours – inverted *Wind Zone I: 1.75/3 hours – upright *Wind Zones II/III: 1.75/3 hours –inverted *Wind Zones II/III: 1.75/3 hours – upright	Wind Zone I: 2.50/1 minute – inverted Wind Zone I: 1.75/1 minute – upright Wind Zones II/III: 2.0/1 minute – inverted Wind Zones II/III: 1.75/1 minute – upright

\*Note –The previous standards do not specify either the inverted or upright uplift load test method. Therefore, either method was acceptable under the existing standards and most roof truss designs were certified using the inverted/nonconservative roof truss testing procedure.

## II. Analysis of Public Comments

The public comment period on the proposed rule closed August 16, 2010, and 12 public comments were received in response to the proposed rule. Comments were submitted by suppliers of roof trusses, manufactured home producers, a Design Approval Primary Inspection Agency, and two manufactured housing trade associations. All public comments can be found and reviewed at [www.regulations.gov](http://www.regulations.gov).

### A. The Comments Generally

Comment: Generally, the commenters expressed various concerns about HUD's proposed changes to the roof truss testing requirements. In particular, the commenters questioned the need to requalify and retest all existing roof truss designs based on past truss performance under snow and wind loading. They also expressed concerns on significant cost increases to consumers and the estimated time (18 months) needed to requalify and retest all roof

truss designs (there are approximately 1,500 existing truss designs, as estimated by a major truss supplier) currently used by manufactured home producers that would result from implementation of the proposed rule.

HUD Response: HUD agrees that the risk against truss failure in snow load areas is minimal based on past performance. As a result, the final rule limits the retesting to new truss designs in all three wind zones, and to the estimated 150 existing truss designs used in high wind areas (Wind Zones II and III) where the reliability and enhanced protection is needed to mitigate against future wind damage and to enhance wind safety in manufactured homes. HUD is also delaying implementation for 12 months to provide manufacturers sufficient time to retest existing trusses for Wind Zones II and III and minimize disruption to the availability of qualifying trusses. HUD acknowledges that wind damage to homes produced to meet its high wind standards has been reduced in wind events that have occurred since the implementation of the high wind requirements. However, while the damage to those homes has been relatively minimal, questions remain about the intensity of the windstorms and whether they were considered to be design wind events or were at lower wind speeds than required to be resisted by the standards.

Comment: Commenters also questioned the need to eliminate the inverted test procedure currently being used to assess uplift resistance of roof trusses in high wind areas. One commenter (a truss supplier) recommended that a higher factor of safety or overload of 2.0 times the design live load should be used to conduct inverted uplift roof truss testing and indicated that it would provide a close approximation to the overload proposed by HUD for the upright uplift wind test of 1.75 times the design live load.

HUD Response: HUD agrees with the commenter. As a result, the final rule allows the use of either upright or inverted testing for Wind Zones II or III, with a higher factor of safety of

2.0 for inverted testing, provided additional initial tests are used to qualify the design, and more frequent follow-up testing to verify continued truss performance under production conditions.

Comment: Commenters questioned the cost impact of increasing the overload factor of safety from 1.75 times the design live load for 12 hours to 2.0 times the design live load for 6 hours for the proof load test procedure in the proposed rule.

HUD Response: HUD recognizes this issue and, in the final rule, allows both the 2.0 overload/6 hour test and the 1.75/12 hour test to be used for evaluating roof trusses under the proof load test procedure.

## **B. Specific Issues for Comment**

Question 1: Under the proposed rule, the proof load test or the ultimate load test can be used to qualify trusses in high snow load areas. Should the more stringent and reliable ultimate load test procedure be required only to qualify roof trusses designed for use in high snow load areas, such as the North and Middle Roof Load Zones, where the risk of roof and truss failure is greater?

Comment: The commenters indicated that HUD should maintain the option to use either test method in all roof load zones and that HUD should not adopt different requirements for North and South roof load zones because of past performance history of roof trusses in high snow load areas.

HUD Response: HUD agrees with the commenters and has not specified roof load zones for which the proof load or ultimate load test procedure must be used in the final rule.

Question 2: Should the spacing between hydraulic or pneumatic cylinders for the test fixture be increased from 12 inches to 24 inches in Figures 3280.402(b)(1) and 3280.402(b)(3)? Should the distance between friction pads along the top chord of the truss of the test fixture be increased from 6 inches to 12 inches in Figure 3280.402(b)(1)? Should the distance between

1-inch straps attached around the cylinder shoe and the top chord of the truss of the test fixture be increased from 6 inches to 12 inches in Figure 3280.402(b)(3)?

Comment. The commenters indicated that the loading cylinders should be maintained at 12 inches and that the loading shoes should be 6 inches long with loading pads at each end to provide a more realistic simulation of a uniformly distributed loading upon the truss.

HUD Response: HUD agrees with the commenters that the cylinders spacing needs to be maintained at 12 inches to more closely simulate uniform loading of the truss, and the loading shoes need to be 6 inches long with loading pads at each end, and has specified these requirements in the final rule.

Question 3: Should the overload period for all wind uplift tests be increased from 1 minute to 3 hours, as is currently required for uplift tests in the standards for the inverted test procedure?

Comment: The commenters recommended that the 1-minute overload time is adequate since wind pressures are based on a 3-second peak gust.

HUD Response: HUD agrees with the commenters and a 1-minute overload time is now permitted for all uplift tests required by the final rule.

Question 4: Should a wind uplift test always be required for trusses qualified for use in Wind Zone I instead of allowing the determination to be made by a Registered Engineer or Registered Architect or independent third-party agency that is certifying the design?

Comment: The commenters indicated that a registered design professional will possess the necessary knowledge and experience to decide if a wind uplift test is needed in Wind Zone I, especially since the design load requirements are low compared to meeting the overload requirements for vertical downward snow or gravity loading.

HUD Response: HUD agrees with the commenters that a registered design professional has the knowledge and experience to determine if a wind uplift test is needed for Wind Zone I, and the final rule allows for such determinations to be made.

### **III. Changes to the Proposed Rule, in this Final Rule**

After considering the issues raised by the commenters and HUD's own evaluation of issues related to this final rule, HUD is making the following specific changes to the June 16, 2010, proposed rule and current roof truss testing requirements in § 3280.402 of the Construction and Safety Standards.

1. In § 3280.402(a), upon the effective date of the rule, testing procedures will be required for new roof truss designs in all three wind zones and for existing truss designs used in high wind areas (Wind Zones II and III).

2. In § 3280.402(d)(1), the proof load test (formally known as the non-destructive test procedure) contains both the proposed test method (2.0 times the design live load for 6 hours) as well as the existing non-destructive test method (1.75 times the design live load for 12 hours). Three consecutive tests of truss assemblies made with average quality materials and workmanship must meet all acceptance criteria, including new deflection limits for dead load, in order for the truss design to be acceptable.

3. In § 3280.402(d)(2), the ultimate load test procedure (2.5 times the design live load for 5 minutes) requires that two consecutive tests of truss assemblies made with average quality workmanship and materials meet all acceptance criteria, including new deflection limits for dead load, in order for the truss design to be acceptable.

4. In § 3280.402(d)(3), the final rule requires that for new truss designs to be used in Wind Zone I, when deemed necessary by a Professional Engineer or Registered Architect, at least one truss must meet all acceptance criteria and sustain 2.5 times the net design uplift load



(22.5) for the inverted test procedure or 1.75 times the design uplift load (15.75) for at least 1 minute. For Wind Zone I, this results in an increase in the factor of safety from 1.75 to 2.5 for trusses tested for uplift in the inverted position, maintains the current factor of safety for uplift testing at 1.75 for trusses tested in the upright position, and reduces the period of overload testing from 3 hours to 1 minute for both test methods. For roof trusses designed to be used in Wind Zones II and III, both the currently utilized inverted test method and new upright test method may be used for conducting the wind uplift load test. However, there are different factors of safety and the number of tests required for each test procedure. For the inverted test method (load applied to the bottom chord of the truss), three consecutive tests must meet all acceptance criteria and sustain at least 2.0 times the design uplift load for 1 minute. For the upright test method (load applied to the top chord of the truss), two consecutive tests must meet all acceptance criteria and sustain 1.75 times the design live load for 1 minute.

5. In § 3280.402(e), the follow-up testing procedures and in-house quality control program requirements have been clarified for both manufacturers of roof trusses and for home manufacturers producing roof trusses for their own use. In addition, one truss test is to be conducted after the first 100 trusses have been produced, with a subsequent test for every 2,500 trusses qualified by either the proof load test procedure or by the inverted test procedure. One truss test will also be required for every 4,000 trusses produced, for trusses qualified under the ultimate load procedure or the upright uplift test procedure.

6. For consistency within 24 CFR part 3280, HUD is substituting reference to a nationally recognized testing laboratory for the reference to an independent third-party agency throughout this rule.

#### **IV. Modifications to MHCC Recommendations**

After reviewing the proposed recommendations for the revised truss testing procedures recommended by MHCC, HUD had concerns regarding one of MHCC's recommendations for uplift load testing. In the proposed rule published on June 16, 2010, HUD solicited comments from the public on both MHCC's recommendation as submitted to HUD, and HUD's modification of its recommendation in the proposed rule, and is further modifying MHCC's recommendation for uplift load testing.

*HUD's Further Modifications to MHCC's Proposed Revision to § 3280.402(d)(3).*

Based on the review of comments received from the public, HUD is further modifying the recommendation from MHCC on uplift testing, because MHCC's overload provisions for uplift load tests in the inverted position were deemed to be too conservative. HUD now agrees with MHCC that either test method, inverted or upright, should be permitted to evaluate uplift resistance of trusses designed to be used in Wind Zones II and III. However, this final rule requires that three consecutive trusses be successfully tested utilizing an overload factor of safety of 2.0 for trusses evaluated using the inverted test method. HUD's modification for upright testing is based in part on the findings of a study conducted by the National Association of Home Builders Research Center (NAHB-RC), "Comparison of Methods for Wind Uplift Load Testing of Roof Trusses for Manufactured Housing," and the requirements of the National Fire Protection Association (NFPA) consensus process related to uplift testing. In particular, the NAHB-RC study found that trusses tested in the inverted position failed at higher loads, had smaller mid-span deflections, and experienced different fail modes than trusses tested in the upright position. This is because the difference in truss orientation results in the uplift load being applied by pulling up on the top chord of the truss in the upright position (in the manner in which the wind would apply load to the trusses), while, in the inverted position, the uplift load is applied by pushing down on the bottom chord of the truss.

The regulatory language submitted by MHCC on this section, including introductory language that has not been modified but which provides context for MHCC's language, is as follows:

\* \* \* \* \*

(d) \* \* \*

(3) Uplift Load Tests. Each truss design must also pass all requirements of the uplift load test, as applicable, in paragraph (i) or (ii) and paragraphs (iii) and (iv) of this section.

\* \* \*

(iii) Trusses designed for use in Wind Zone I, when tested [see (i) above], must be tested in either the inverted position to 2.5 times the net wind uplift load or in the upright position to 1.75 times the net wind uplift load. Trusses designed for use in Wind Zones II and III must be tested in the inverted position to 2.5 times the uplift load, minus the dead load, or to 1.75 times the uplift load, minus the dead load in the upright position. [See Figure 3280.402(b)(3)].

(iv) The following describes how to conduct the uplift test with the truss in the upright position. Similar procedures must be used if conducting the test in the inverted position.

\* \* \*

(D) Continue to load the truss to 1.75 times the net uplift load and maintain the full load for 1 minute. (When tested in the inverted position, continue to load the truss to 2.5 times the net uplift load and maintain the load for 3 hours.) See paragraph (i) for the net uplift load in Wind Zone I and paragraph (ii) for the uplift load for Wind Zones II and III. Regardless of the test position of

the truss, upright or inverted, trusses maintain the overload for the specified time period without rupture, fracture, or excessive yielding.

\* \* \* \* \*

## **V. Findings and Certifications**

### Regulatory Review – Executive Orders 12866 and 13563

Under Executive Order 12866 (Regulatory Planning and Review), a determination must be made whether a regulatory action is significant and, therefore, subject to review by the Office of Management and Budget (OMB) in accordance with the requirements of the order. Executive Order 13563 (Improving Regulations and Regulatory Review) directs executive agencies to analyze regulations that are “outmoded, ineffective, insufficient, or excessively burdensome, and to modify, streamline, expand, or repeal them in accordance with what has been learned. Executive Order 13563 also directs that, where relevant, feasible, and consistent with regulatory objectives, and to the extent permitted by law, agencies are to identify and consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public.

The Office of Management and Budget (OMB) reviewed this rule under Executive Order 12866. This rule was determined to be a "significant regulatory action," as defined in section 3(f) of the Order (although not an economically significant regulatory action under the Order). This rule would affect costs for manufactured home manufacturers.

As discussed in this preamble, this rule would amend the required truss testing procedures of the Federal Manufactured Home Construction and Safety Standards to current industry methods and equipment in order to improve the performance and safety of trusses in high wind areas and to enhance the reliability and durability of trusses. Specifically, this rule would modify upright or inverted test procedures in high wind areas in order to prevent premature failures of trusses. This rule also would modify the current non-destructive test

procedure to require a higher factor of safety and reduces the time required to conduct the test as well as the follow-up testing intervals. In response to public comments, this final rule will not require retesting of existing truss designs for manufactured housing located in Wind Zone I, which was included in the proposed rule. The final rule will only require testing of new roof truss designs to be used in Wind Zone I and only require testing for uplift resistance in Wind Zone I when required by a Professional Engineer or Registered Architect. Based on HUD's review of this final rule, HUD has determined that this final rule imposes one-time costs totaling \$0.075 million and discounted production costs ranging from \$4.8 million, assuming a 7 percent discount rate, to \$7.4 million, assuming a 3 percent discount rate. Although difficult to predict, the discounted benefits of the rule, including prevented damage, injury and loss of life, are expected to exceed the costs imposed by this rule. Avoiding one death in the first year, for example, would offset the 30-year discounted costs by 83 percent, assuming the 3 percent discount rate, and offset the costs by 126 percent; i.e., exceed the costs, assuming the 7 percent discount rate. If one death was avoided at the end of the 30-year period, the discounted benefits from the prevented loss of life alone, not including damage prevented, would account for 35 percent of the increased costs, using a 3 percent discount rate, or 18 percent, assuming a 7 percent discount rate. Similarly, while the number and strength of high wind events make it difficult to provide an exact estimate, the benefits of the rule would offset costs if 44 percent of estimated property damage was prevented. Overall, HUD has determined that the total impact of this rule will not exceed the \$100 million threshold as provided by Executive Order 12866.

The cost of this rule includes (1) a one-time retesting of existing truss designs used in Wind Zones II and III, (2) redesign costs of existing designs that do not meet the new testing requirements of this final rule, and (3) an increase in annual production costs. These costs are evaluated with respect to wind zone classifications. Wind Zone I homes have the least stringent

construction standards and Wind Zone III homes have the most stringent construction standards. Approximately 90 percent of the units produced annually are constructed to Wind Zone I standards and would not be subject to the retesting requirement.

HUD estimates that there are approximately 150 truss designs in use for Wind Zones II and III, and that the cost of retesting, recertifying, and redesigning the truss designs will cost producers approximately \$500 per truss design. As a result, the total cost of retesting, recertifying, and redesigning truss designs for Wind Zones II and III is assessed to be \$75,000 based on current production levels of 4,620 shipments.

In order to meet the testing standards provided by this final rule, HUD expects that 75 percent of the designs currently used for Wind Zones II and III will require modification. The increased construction cost to meet the new standards is estimated at \$1.00 per truss. Based on an average of 51 trusses per transportable section in Wind Zones II and III, and 1.64 transportable sections per home, the annual increase in truss construction costs total \$289,170 (7,560 transportable sections \* 51 trusses per section \* \$1.00 increase in production cost \* 75 percent of trusses produced). Over a 30-year period, the discounted value of the increase in production costs total \$4.8 million, assuming a 7 percent discount rate, or \$7.4 million, assuming a 3 percent discount rate.

With respect to benefits, this final rule will make manufactured housing less susceptible to wind damage and downward pressure by enhancing roof construction. The wind damage enhancements protect against high wind events such as hurricanes and tropical storms. Such damage to the manufactured home ranges from complete failure of the truss, in which the truss completely separates from the house section, to localized failure or minor separation that leads to progressive structural damage and damage from water entry. Complete failure of the truss not only destroys the home itself, but in high wind events, can result in “missile” damage to

adjoining structures. Even minor localized failure can over time lead to complete failure and eventually result in “missile” damage in a later, perhaps weaker, wind event. In addition, there will be less collateral damage to housing and other structures adjacent to manufactured housing.

Quantifying the benefits of this rule, however, is difficult due to the high annual variance in frequency and force of storms. Further, there is virtually no detailed information concerning cost estimates of damaged manufactured homes from strong wind or snow events. However, it is possible to produce a reasonable, conservative estimate of property damage that could be avoided due to the requirements in this final rule. Due to the uncertainty of the occurrence and severity of natural disasters, a range of expected benefits are presented. However, the estimates below only represent a partial valuation of the expected benefits since it is not possible to estimate the damage occurring from heavy snow storms.

Based on 2008 housing data from the U.S. Postal Service<sup>2</sup> and the Census Bureau’s Survey of Manufactured Housing, newly shipped manufactured housing accounts for 0.076 percent of the total housing stock in states prone to hurricane strikes. An approximation of the damage occurring to manufactured housing totals \$836,634 (\$1,194,4 million \* 0.076 percent). The discounted value of the annual damage over 30 years is \$11.1 million, assuming a 7 percent discount rate, or \$16.9 million, assuming a 3 percent discount rate. The higher standards resulting from the tests required by this final rule would prevent a portion of this damage, although the annual variability in the number and strength of high wind events makes it difficult to provide a precise estimate. In order for the benefits to exactly offset the costs imposed by this rule, 44 percent of the damage would need to be prevented. This percentage should not be considered a maximum, as it does not include damage from other types of weather events, such as heavy snowfall, or prevented deaths, which is also discussed below.

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<sup>2</sup> See <http://www.huduser.org/datasets/usps.html>.

In addition to the improved safety in high wind events, the increased reliability of trusses that result from this rule will also benefit areas receiving high snowfall. Homes located in high snow load areas are susceptible to collapse in heavy snow storms. The new testing standards will decrease the number of such occurrences as new trusses are designed. Although no data exists on the amount of property damage due to such events, especially to manufactured housing, it is reasonable to assume that additional benefits would accrue to owners of manufactured housing as a result of this final rule.

In addition to avoiding property damage, this rule will also prevent injuries and deaths that occur during hurricanes, tropical storms, and other high wind events; although it is difficult to estimate the number of injuries and deaths that would be prevented, it is reasonable to expect that deaths and injuries would decrease in response to this final rule. Government estimates of the value of a human life range from \$6.2 million used by the Department of Transportation (DOT) to \$9.1 million used by the Environmental Protection Agency (EPA). HUD uses the DOT estimate in the current analysis. Avoiding one death in the first year would offset the 30-year discounted cost by 83 percent, assuming the 3 percent discount rate, and offset the costs by 126 percent; i.e., exceed the costs, assuming the 7 percent discount rate. If one death was avoided at the end of the 30-year period, the discounted benefits from the prevented loss of life alone, not including damage prevented, would account for 35 percent of the increased costs, using a 3 percent discount rate, or 18 percent assuming a 7 percent discount rate.

In summary, this final rule will impose one-time costs totaling \$75,000, and discounted production costs ranging from \$4.8 million to \$7.4 million. Although difficult to predict, the discounted benefits, including prevented damage and prevented injury and loss of life, are expected to exceed the costs imposed by this rule. Overall, the total impact of this rule will not exceed the threshold of \$100 million as required by Executive Order 12866.



The docket file is available for public inspection in the Regulations Division, Office of General Counsel, Department of Housing and Urban Development, 451 7th Street, SW, Room 10276, Washington, DC 20410-0500. Due to security measures at the HUD Headquarters building, please schedule an advance appointment to review the public comments by calling the Regulations Division at 202-402-3055 (this is not a toll-free number). Individuals with speech or hearing impairments may access this number through TTY by calling the Federal Information Relay Service at 1-800-877-8339.

#### Environmental Impact

A Finding of No Significant Impact with respect to the environment has been made in accordance with HUD regulations at 24 CFR part 50, which implement section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)). That finding is available for public inspection between the hours of 8 a.m. and 5 p.m. weekdays in the Regulations Division, Office of General Counsel, Department of Housing and Urban Development, 451 7th Street, SW, Room 10276, Washington, DC 20410-0500. Due to security measures at the HUD Headquarters building, please schedule an appointment to review the finding by calling the Regulations Division at 202-708-3055 (this is not a toll-free number).

#### Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) (5 U.S.C. 601 et seq.) generally requires an agency to conduct a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements, unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. This rule would regulate establishments primarily engaged in making manufactured homes under North American Industry Classification Standard (NAICS) 32991. The Small Business Administration's size standards define as small an establishment primarily engaged in making manufactured homes if it does not exceed 500

employees. Of the 123 manufactured home operations included under this NAICS definition, 55 are small manufacturers that fall below the small business threshold of 500 employees. The rule would apply to all of the manufacturers and would, therefore, affect a substantial number of small entities. For the reasons stated below, HUD knows of no instance in which a manufactured home manufacturer with fewer than 500 employees would be significantly affected by this rule.

HUD, with the concurrence of MHCC, conducted an economic cost impact analysis for this rule. A copy of the analysis is available for public inspection and copying between 8 a.m. and 5 p.m. weekdays at the Regulations Division, Office of General Counsel, Department of Housing and Urban Development, 451 7th Street, SW, Room 10276, Washington, DC 20410-0500. The analysis determined the average potential cost impact, based on a per-home cost, to be approximately \$8, multiplied by an estimated number of 46,000 homes produced in a year, which equals about \$364,000 annually. The estimated average per-home cost in Wind Zone II and Wind Zone III is \$79, based on an annual production estimate of 4,600 manufactured homes. This does not represent a significant economic effect on either an industry-wide or per-unit basis.

These two relatively small increases in cost would not impose a significant burden for a small business involved in the production of homes that typically cost the purchaser between \$40,000 and \$100,000. Therefore, although this rule would affect a substantial number of small entities, it would not have a significant economic impact on them. Accordingly, the undersigned certifies that this rule will not have a significant economic impact on a substantial number of small entities.

#### Executive Order 13132, Federalism

Executive Order 13132 (entitled “Federalism”) prohibits an agency from promulgating a rule that has federalism implications if the rule either imposes substantial direct compliance costs on state and local governments and is not required by statute, or the rule preempts state

law, unless the agency meets the consultation and funding requirements of section 6 of the Executive Order. This rule does not have federalism implications and does not impose substantial direct compliance costs on state and local governments nor preempt state law within the meaning of the Executive Order.

#### Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1531-1538) (UMRA) establishes requirements for federal agencies to assess the effects of their regulatory actions on state, local, and tribal governments and on the private sector. This rule does not impose any federal mandates on any state, local, or tribal governments or the private sector within the meaning of UMRA.

#### Catalog of Federal Domestic Assistance

The Catalog of Federal Domestic Assistance number for Manufactured Home Construction and Safety Standards is 14.171.

#### **List of Subjects in 24 CFR Part 3280**

Housing standards, Manufactured homes.

Accordingly, for the reasons stated in the preamble, HUD amends 24 CFR part 3280 to read as follows:

#### **PART 3280-MANUFACTURED HOME CONSTRUCTION AND SAFETY STANDARDS**

**1.** The authority citation for part 3280 continues to read as follows:

**Authority:** 42 U.S.C. 3535(d), 5403, and 5424.

**2.** Revise § 3280.402 to read as follows:

**§ 3280.402 Test procedures for roof trusses**

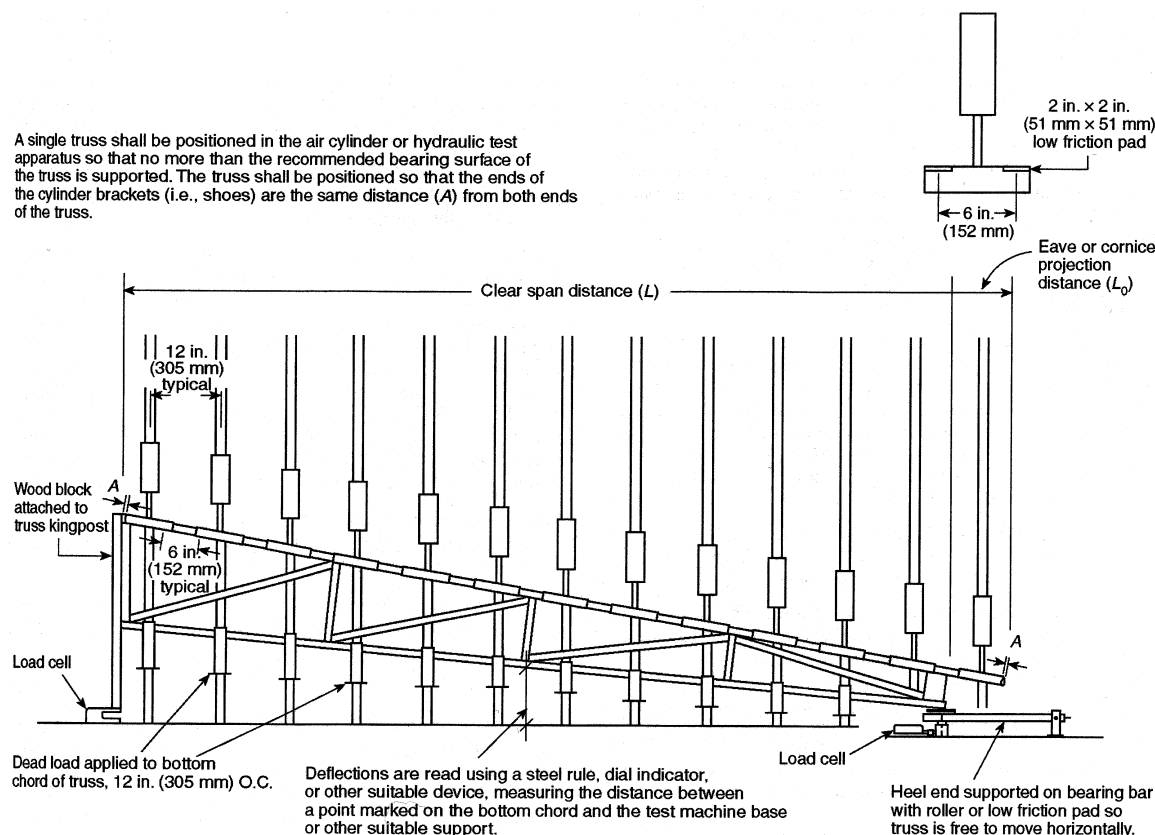
(a) Roof load tests. This section provides the roof truss test procedure for vertical loading conditions. Where roof trusses act as support for other members, have eave or cornice projections, or support concentrated loads, roof trusses must also be tested for those conditions. These test procedures are required for new truss designs in all three wind zones and for existing truss designs used in Wind Zones II and III.

(b) General. Trusses must be tested in a truss test fixture that replicates the design loads, and actual support points, and does not restrain horizontal movement. When tested singly or in groups of two or more trusses, trusses shall be mounted on supports and positioned as intended to be installed in the manufactured home in order to give the required clear span distance (L) and eave or cornice distance (Lo), if applicable, as specified in the design.

(1) When trusses are tested singly, trusses shall be positioned in a test fixture, with supports properly located and the roof loads evenly applied. See Figure 3280.402(b)(1).

Figure 3280.402(b)(1) – Test fixture for testing trusses singly.

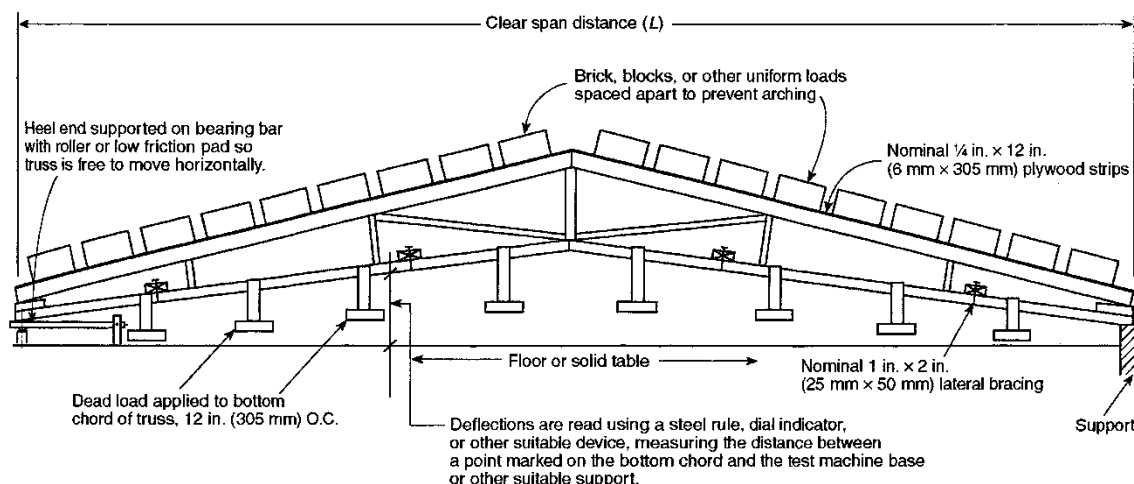
A single truss shall be positioned in the air cylinder or hydraulic test apparatus so that no more than the recommended bearing surface of the truss is supported. The truss shall be positioned so that the ends of the cylinder brackets (i.e., shoes) are the same distance (A) from both ends of the truss.



(2) When tested in groups of two or more, the top chords are permitted to be sheathed with nominal 1/4-inch x 12-inch plywood strips. The plywood strips shall be at least long enough to cover the top chords of the trusses at the designated design truss spacing. Adjacent plywood strips shall be separated by at least 1/8-inch. The plywood strips shall be nailed with 4d nails or equivalent staples no closer than 8 inches on center along the top chord. The bottom chords of the adjacent trusses shall be permitted to be one of the following:

- (i) Unbraced; or
- (ii) Laterally braced together (not cross-braced) with 1-inch x 2-inch stripping no closer than 24 inches on center, nailed with only one 8d nail at each truss. See Figure 3280.402(b)(2).

Figure 3280.402(b)(2) – Test set-up for roof trusses tested in groups of two or more.



(c) Measuring and loading methods. Deflections must be measured at the free end of an eave or cornice projection and at least at the truss mid-span and quarter points. Scissors or other unique truss configurations are to be measured at as many additional bottom chord panel points as necessary to obtain an accurate representation of the deflected shape of the truss so as to be able to locate and record the point(s) of maximum deflection. Deflections must be read and recorded relative to a fixed reference datum. Deflections must be read and recorded to the nearest 1/32-inch. Dead load must be applied to the top and bottom chord, and live load must be applied to the top chord through a suitable hydraulic, pneumatic, or mechanical system or weights to simulate design loads. Load unit weights for uniformly distributed top chord loads must be separated so that arch action does not occur and be spaced not more than 12 inches on center so as to simulate uniform loading. Bottom chord loading must be spaced as uniformly as practical. Truss gravity loads must be calculated based on the overall truss length (horizontal projection), including eave or cornice projections.

(d) Testing procedures. Either the testing method in paragraph (d)(1) or (d)(2) of this section may be used, however, the testing method in paragraph (d)(3) of this section must be used, to test trusses to establish compliance with the provisions of these standards.

(1) Proof load truss test procedure. At least three average quality/consecutively tested trusses must pass all requirements of the test, for initial qualification of the truss design. All tests for initial qualification of the truss designs evaluated by this procedure must be certified by a Registered Engineer or Architect, or by a nationally recognized testing laboratory. An in-house quality control and follow-up testing program (see paragraphs (e) and (f) of this section) must be approved prior to entering production of any truss design evaluated by this procedure.

(i) Dead load. Measure and record initial elevation of the truss or trusses in the test position at no load. Apply to the top and bottom chords of the truss dead loads that are representative of the actual weights of materials to be supported by the truss. However, the dead load may only be applied as indicated in paragraph (e)(4) of this section for ongoing follow-up testing. Dead loads to be applied to the truss test assembly are permitted to include only the weights of materials supported by the truss and not the weight of the truss itself. However, readings from load cells (when used) on which the test truss rests must reflect the sum of the applied load plus the weight of the truss. Apply dead loads and hold for 5 minutes. Measure and record the deflections.

(ii) Live load. Maintaining the dead loads, apply live load to the top chord in approximate 1/4 live load increments until dead load plus the live load is reached. Measure and record the deflections no sooner than one minute after each 1/4 live load increment has been applied and 5 minutes after the full live load has been reached.

(iii) Initial recovery phase. Remove the design live load but not the dead load. Measure and record the deflections 5 minutes after the total live load has been removed.

(iv) Continue to load the truss to:

(A) Dead load plus 2.0 times the design live load. Maintain this loading for 6 hours and inspect the truss for failure. Failure is rupture, fracture, or excessive yielding; or

(B) Dead load plus 1.75 times the design live load. Maintain this loading for 12 hours and inspect the truss for failure. Failure is rupture, fracture, or excessive yielding.

(v) Final recovery phase. Remove 2.0 times the design live load, but not the dead load or 1.75 times the design live load, but not the dead load. Measure and record deflections within 4 hours after removing 2.0 times the design live load or 1.75 times the design live load.

(vi) Acceptance criteria. The truss design is acceptable if all of the following conditions are met:

(A) The maximum deflection between no load and dead load must be  $L/480$  or less for simply supported clear spans and  $L_o/180$  or less for eave and cornice projections; and

(B) The maximum deflection between dead load and design live load must be  $L/180$  or less for simply supported clear spans and  $L_o/90$  or less for eave and cornice projections; and

(C) After the design live load is removed, and with the dead load still applied, the maximum recovery deflection must be  $L/360$  or less for simply supported spans and  $L_o/180$  or less for eave and cornice projections; and

(D) The truss must maintain the overload condition for 6 hours without rupture or fracture, or excessive yielding; and

(E) After 2.0 times the design live load has been removed, and with the dead load still applied, the maximum recovery deflection must be  $L/180$  or less for simply supported clear spans and  $L_o/90$  or less for eave and cornice projections; and

(F) As applicable, each truss design must also meet all requirements for uplift loads required by paragraph (d)(3) of this section. For Wind Zone I uplift load requirements, see paragraph (d)(3)(i) of this section. For Wind Zones II and III uplift load requirements, see paragraph (d)(3)(ii) of this section.



(2) Ultimate load truss test procedure. (i) At least two average quality/consecutively tested trusses must pass all requirements of the test, for initial qualification of the truss design. All tests for initial qualification of the truss designs evaluated by this procedure must be certified by a Registered Engineer or Architect, or by a nationally recognized testing laboratory. An in-house quality control and follow-up testing program (see paragraph (e) and (f) of this section) must be approved prior to entering production of any truss design evaluated by this procedure.

(ii) Dead load. Measure and record initial elevation of the truss or trusses in the test position at no load. Apply to the top and bottom chords of the truss dead loads that are representative of the actual weights of materials to be supported by the truss. However, the dead load may only be applied as indicated in paragraph (e)(4) of this section for ongoing follow-up testing. Dead loads to be applied to the truss test assembly shall be permitted to include only the weights of materials supported by the truss, and not the weight of the truss itself. However, readings from load cells (when used) on which the test truss rests must reflect the sum of the applied load plus the weight of the truss. Apply dead loads and hold for 5 minutes. Measure and record the deflections.

(iii) Live load. Maintaining the dead loads, apply live load at a uniform rate to the top chord in approximate 1/4 live load increments until the dead load plus the live load is reached. Measure and record the deflections no sooner than one minute after each 1/4 live load increment has been applied and 5 minutes after the full live load has been reached.

(iv) Initial recovery phase. Remove the design live load but not the dead load. Measure and record the deflections 5 minutes after the design live load has been removed.

(v) Overload phase. After the recovery phase is completed, reapply the full live load to the truss assembly. Additional loading shall then be applied continuously until the dead load

plus 2.5 times the design live load is reached. This overload condition must be maintained for at least 5 minutes.

(vi) Final recovery phase. Remove 2.5 times the design live load but not the dead load. Measure and record deflections within 4 hours after 2.5 times the design live load has been removed.

(vii) Acceptance criteria. The truss design is acceptable if all of the following conditions are met:

(A) The maximum deflection between no load and dead load must be  $L/480$  or less for simply supported clear spans and  $L_o/180$  or less for eave and cornice projections; and

(B) Dead load to design live load deflections shall be  $L/180$  or less for simply supported clear spans and  $L_o/90$  or less for eave and cornice projections; and

(C) After the design live load is removed and with the dead load still applied, the maximum recovery deflection must be  $L/360$  or less for simply supported spans and  $L_o/180$  or less for eave and cornice projections; and

(D) The truss shall maintain the overload condition for 5 minutes without rupture, fracture, or excessive yielding; and

(E) After 2.5 times the design live load is removed, and with the dead load still applied, the truss must recover to at least  $L/180$  for simply supported clear spans and  $L_o/90$  for eave and cornice within 4 hours after the total live load has been removed; and

(F) As applicable, each truss design must also meet all requirements for uplift loads in Wind Zone I or Wind Zone II and III, as required by paragraph (d)(3) of this section. For Wind Zone I uplift load requirements, see paragraph (d)(3)(i) of this section. For Wind Zones II and III uplift load requirements, see paragraph (d)(3)(ii) of this section.

(3) Uplift load tests. Each truss design must also pass all requirements of the uplift load test, as applicable, in paragraph (d)(3)(i) or (d)(3)(ii) and paragraphs (d)(3)(iii) and (d)(3)(iv) of this section.

(i) Wind Zone I uplift load test. Where there are engineered connectors between the top chord and web members of the truss, such as metal connector plates or wood gussets or their equivalents, uplift testing in Wind Zone I is at the discretion of the Registered Engineer or Architect or nationally recognized testing laboratory certifying the truss design. When testing is deemed necessary by the Registered Engineer or Architect or nationally recognized testing laboratory certifying the truss design, a minimum of one average quality uplift load test is to be conducted for each such truss design and must pass all requirements of the test for initial qualification of the truss design. The net uplift load for trusses designed for use in Wind Zone I is 9 psf for the clear span of the truss and 22.5 psf for eave or cornice projections.

(ii) Wind Zones II and III uplift loads test. This test is required for all trusses designed for use in Wind Zones II and III. A minimum of three average quality/consecutive uplift load tests are to be conducted for each truss design when tested in the inverted position and a minimum of two average quality/consecutive uplift load tests are to be conducted for trusses in the upright position. The trusses must pass all requirements of the test for initial qualification of the truss design. The uplift load for trusses designed to be used in Wind Zones II and III for the clear span or eave cornice projections is to be determined by subtracting the dead load applied to the truss from the uplift load provided in the Table of Design Wind Pressures in § 3280.305(c)(1)(ii)(B).

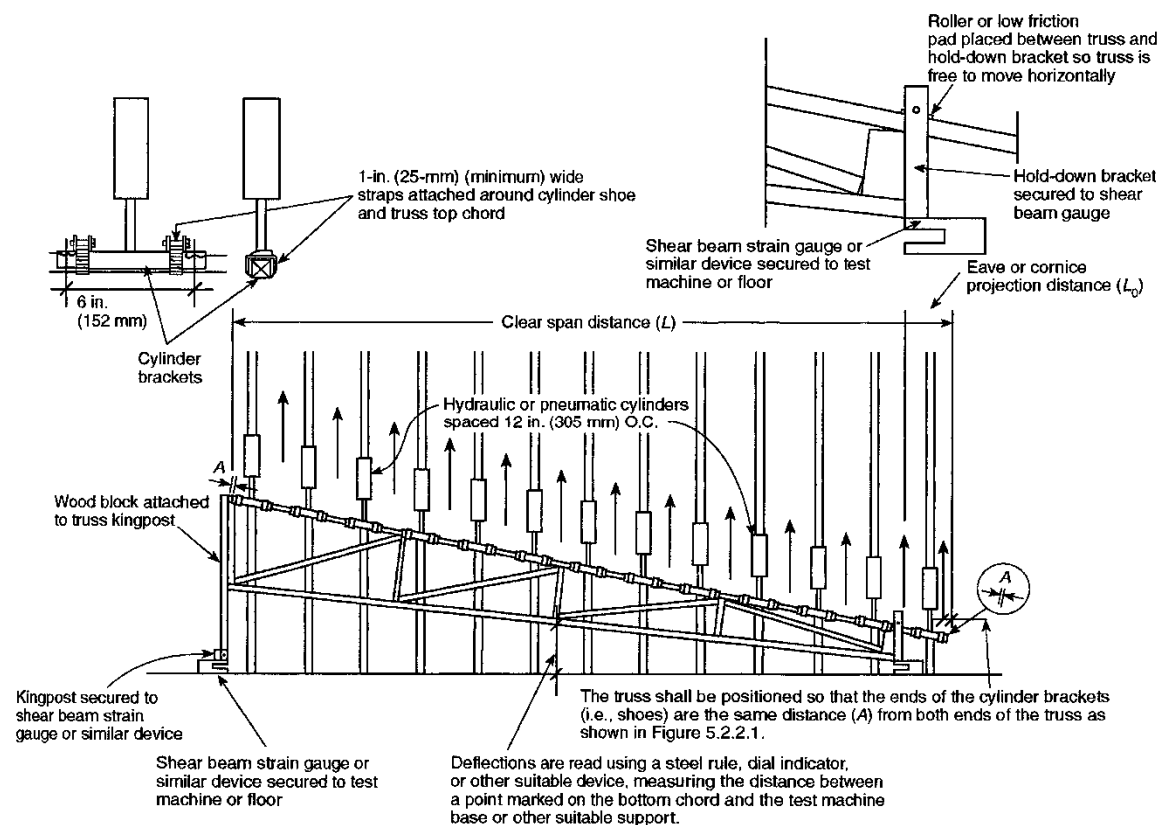
(iii) Trusses designed for use in Wind Zone I, when tested (see paragraph (d)(3)(i) of this section), must be tested in either the inverted position to 2.5 times the net wind uplift load or in the upright position to 1.75 times the net wind uplift load. Trusses designed for use in Wind

Zones II and III (see paragraph (d)(3)(ii) of this section) must be tested to 2.0 times the uplift load minus the dead load in the inverted position and to 1.75 times the uplift load minus the dead load in the upright position. See Figure 3280.402(b)(3).

(iv) The following describes how to conduct the uplift test with the truss in the upright position. Similar procedures must be used if conducting the test in the inverted position.

(A) Place the truss in the test fixture and position as it is intended to be installed in the manufactured home. See Figure 3280.402(b)(3).

Figure 3280.402(b)(3) – Test setup for roof trusses tested for uplift in the upright position.



(B) Position the load measurement devices to register the wind uplift loads that will be applied to the top chord of the truss. The uplift loads shall be applied through tension devices

not wider than one inch and spaced not greater than approximately 12 inches on center and shall be applied as uniform as possible, so as to simulate uniform loading. Gravity and wind uplift load tests may be performed on the same truss in this single setup mode. For the wind uplift test, it is permissible to stabilize the bottom chord of the truss in the test fixture to simulate ceiling materials or purlin supports. Measure and record the initial elevation of the bottom chord of the truss in the test position at the mid-span and quarter points of the truss, and at the free end of an eave or cornice projection greater than 12 inches. Scissors or other unique truss configurations are to be measured at as many additional bottom chord panel points as necessary to obtain an accurate representation of the deflected shape of the truss, so as to be able to locate and record the point(s) of maximum deflection. Eave or cornice projection loads are applied separately for eaves or cornice projections greater than 12 inches. For eave or cornice projections greater than 12 inches, the additional required load must be applied to the eave simultaneously with the main body load. For eave or cornice projections of 12 inches or less, add the additional required load to the main body load and apply it to the entire top chord.

(C) Measure and record the deflection 5 minutes after the net uplift load has been applied. Design load deflection shall be  $L/180$  or less for a simply supported clear span and  $L_o/90$  or less for eave or cornice projections.

(D) For trusses tested in the upright position, continue to load the truss to 1.75 times the net uplift load in paragraph (d)(3)(i) of this section for Wind Zone I and 1.75 times the uplift load in paragraph (d)(3)(ii) for Wind Zones II and III, and maintain the load for one minute. For trusses tested in the inverted position, continue to load the truss to 2.50 times the net uplift load in paragraph (d)(3)(i) for Wind Zone I and to 2.0 times the uplift load minus the dead load in paragraph (d)(3)(ii) for Wind Zones II and III, and maintain the full load for one minute.

Regardless of the test position of the truss, upright or inverted, trusses must maintain the overload for the specified time period without rupture, fracture, or excessive yielding.

(e) Follow-up testing. Follow-up testing procedures must include the following:

(1) All trusses qualifying under these test procedures must be subject to a quality control and follow-up testing program.

(i) Manufacturers of listed or labeled trusses must follow an in-house quality control program with follow-up testing approved by a nationally recognized testing program as specified in paragraph (e)(3) of this section. The in-house quality control program must include, at a minimum, procedures for quality of materials including, but not limited to, grade(s) of materials, allowable splits, knots, and other applicable lumber qualities; workmanship including, but not limited to, plate placement and embedment tolerances; other manufacturing tolerances; description and calibration of test equipment; truss retesting criteria; and procedures in the event of noncomplying results.

(ii) Those home manufacturers producing trusses for their own use, and which are not listed or labeled, must have an in-house quality control program (see paragraph (i) of this section) that includes follow-up testing, as specified in this section, and is approved by their Design Approval Primary Inspection Agency (DAPIA).

(2) Truss designs that are qualified but not in production are not subject to follow-up testing until produced. When the truss design is brought into production, a follow-up test is to be performed if the truss design has been out of production for more than 6 months.

(3) The frequency of truss manufacturer's quality control follow-up testing for trusses must be at least:

(i) One test for the first 100 trusses produced, with a subsequent test for every 2,500 trusses for trusses qualified under the proof load truss test procedure or inverted uplift test

procedure for trusses used in Wind Zones II and III or once every 6 months, whichever is more frequent, for every truss design produced; or

(ii) One test for every 4,000 trusses produced for trusses qualified under the ultimate load truss test procedure or upright uplift test procedure for trusses used in Wind Zones II and III or once every 6 months, whichever is more frequent, for every truss design produced.

(4) For follow-up testing only, the full dead load may be applied to the top chord of the truss, when the bottom chord dead load is 5 psf or less.

**Dated:** January 8, 2013

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Assistant Secretary for Housing –  
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